

# Cinquante signes

## Digit-spines

janvier 11, 2023





*Le Serpent (entre les articulations, le langage)*, 2022, Gilles **Barbier**

Hello Math-Fun,

The expression « digit-spine » is absent from the OEIS, which is good for future searches about the hereunder topic (should S, T and U enter the OEIS, of course).

Here is S, the lexicographically earliest sequence of distinct nonnegative integers with the property explained below.

$S = 1, 10, 2, 0, 3, 26, 9, 119, 532, 4, 6, 896, 118, 34, 15, \dots$

Call  $p$  the closest prime to  $a(n)$  and  $d$  the absolute difference  $|a(n)-p|$ . We have:

|       |  |
|-------|--|
| $S =$ | 1, 10, 2, 0, 3, 26, 9, 119, 532, 4, 6, 896, 118, 34, 15, ... |
| $p =$ | 2 11 2 2 3 23 7 113 523 3 5 887 113 31 13                    |
| $d =$ | 1 1 0 2 0 3 2 6 9 1 1 9 5 3 2                                |

We see that the successive digits forming  $d$  are the same as the successive digits forming  $S$ . We then propose to say that  $S$  and  $d$  share the same *digit-spine*.

Here are now  $T$ ,  $sq$  and  $d$ , based on the same idea:  $d$  is the distance between  $a(n)$  and the closest square  $sq$ . We have:

|        |  |
|--------|--|
| $T =$  | 10, 1, 2, 6, 42, 20, 7, 11, 4, 56, 3, 5, 21, 30, 43, ... |
| $sq =$ | 9 1 1 4 36 16 9 9 4 49 4 6 25 25 49                      |
| $d =$  | 1 0 1 2 6 4 2 2 0 7 1 1 4 5 6                            |

$T$  and  $d$  share the same digit-spine.

And now,  $U$ , same idea,  $f$  is the closest Fibonacci number:

|       |  |
|-------|--|
| $U =$ | 12, 10, 4, 1, 17, 6, 7, 41, 27, 48, 25, 9, 11, 62, ... |
| $f =$ | 13 8 3 1 13 5 8 34 21 55 21 8 13 55                    |
| $d =$ | 1 2 1 0 4 1 1 7 6 7 4 1 2 7                            |

Again,  $U$  and  $d$  share the same digit-spine.

Best,  
É.

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### Update

Maximilian **Hasler** was quick to answer — and submit:

Eric,

I think the sequence for squares and Fib's should start with 0 (then go on as you wrote).

I propose these sequences as

<https://oeis.org/draft/A359734>

<https://oeis.org/draft/A359736>

<https://oeis.org/draft/A359737>

I put a link to your blog post, but I refrained from using "spine" which already has several other meanings in OEIS, cf. <https://oeis.org/search?q=spine&fmt=short&n=99> (although, yes, there is no "digit-spine" here... but also, is it really a "spine" ? If I understand correctly, the spine would be, e.g., the primes, etc. However, they do not necessarily appear in the sequence (while a "spine" is usually an (important) \*part\* of the body).

Best wishes,

Maximilian

(PARI) - nicer in OEIS

```
md(n) = if ( n , digits(n) , [0] )
```

```
spine ( N = 20, f, S=[], d=[] ) = { vector(N, n, my( m, j=1 ) ;
```

```
for ( k = 0, oo, setsearch(S, k) && next; while( f(j) < k, j++ ) ;
```

```
m = md ( min ( m = f(j) - k, iferr ( k - f(j-1), E, m ) ) ) ;
```

```
if ( m == concat( d, md (k) )[1..#m] ,
```

```
  d = concat( d, md (k) )[#m+1 .. -1]; m=k ; break )) ; S = setunion(S, [m]); m}
```

```
spine( 20, prime )
```

```
= [1, 10, 2, 0, 3, 26, 9, 119, 532, 4, 6, 896, 118, 34, 15, 93, 121, 531, 898, 205, ...]
```

```
spine( 20, x->x^2 )
```

```
= [0, 10, 1, 2, 6, 42, 20, 7, 11, 4, 56, 3, 5, 21, 30, 43, 12, 31, 14, 8, ...]
```

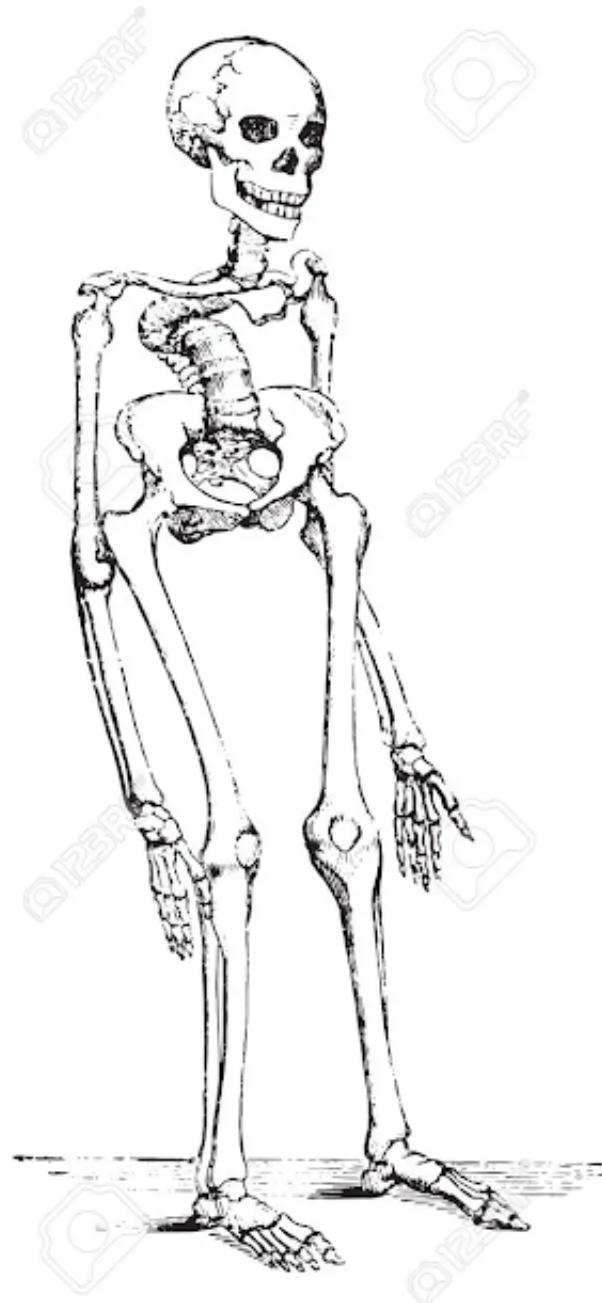
```
spine( 20, fibonacci )
```

```
= [0, 12, 10, 4, 1, 17, 6, 7, 41, 27, 48, 25, 9, 11, 62, 30, 42, 15, 26, 43, ...]
```

<https://oeis.org/search?q=spine&fmt=short&n=99>

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Merci **Maximilian!**



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**MFH** 12 janvier 2023 à 06:11



For the Fibonacci's, I think it should start with 0, then go on as you suggest.



**MFH** 12 janvier 2023 à 06:17

and for squares, too.

## RÉPONDRE

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## Posts les plus consultés de ce blog

### A square for three (chess)

juin 22, 2024



(English translation after the French text) Voici cinq problèmes d'échecs disjoints : a ) combien faut-il de coups au minimum pour que trois pions soient capturés sur la même case ? b ) trois tours c ) trois c ...

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### Le tripalin se présente

avril 11, 2024



Un tripalin est constitué de trois images. Chaque image illustre un substantif. Accolés, ces trois substantifs forment une chaîne palindromique. Laquelle nous vous invitons à trouver. Exer ...

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## Some strings au cinéma Galeries

juillet 19, 2024

Lettre ouverte au cinéma Galeries Bonsoir à tous, Je viens de voir pour la seconde fois chez vous le beau film de Léos Carax (la première fois c'était le 26 juin en présence du réalisateur, au BRIFF). Apparus à l'écran aujourd'hui, avant la projection propre ...

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Images de thèmes de [Michael Elkan](#)



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